

MICHIGAN ENVIRONMENTAL SCIENCE BOARD

AIR PANEL MEETING SUMMARY TUESDAY, FEBRUARY 18, 1997 PARK INN INTERNATIONAL HOWELL, MICHIGAN

PANEL MEMBERS PRESENT

Dr. Lawrence Fischer, Chair
Dr. Raymond Demers
Dr. George Wolff
Dr. Ralph Kummeler
Dr. Jack Harkema
Mr. Keith Harrison, MESB Executive Director

DMB/EAD SUPPORT STAFF PRESENT

Mr. Jesse Harrold, Environmental Officer

I. CALL TO ORDER

Dr. Lawrence Fischer, Chair, called the meeting of Air Panel to order at 9:00 a.m.

Drs. Fischer and Harkema reported on a meeting they had attended regarding current science and regulatory perspectives on particulate matter. The meeting was held in Bethesda, Maryland and was sponsored by the National Capital Area Chapter of the Society of Toxicology and the Association of Government Toxicologist. The focus of the meeting was the impending U.S. Environmental Protection Agency (USEPA) air quality regulations on particulates. Dr. Fischer reported that there was not a lot of new information available, although both sides of the issue were well presented. There were presentations on the basic toxicology of particulates and work that was trying to get at the mechanism through which damage may be caused, but it was not really useful for purposes of the Panel. Dr. Harkema indicated that the USEPA's Clean Air Scientific Advisory Committee's (CASAC) position was explained by Dr. Roger McClelland. Dr. Fischer indicated that he was asked at the meeting whether any PM_{2.5} data exist for Michigan and that his questioner was surprised to find that there were very little. Dr. Wolff stated that there are many other places where PM_{2.5} data do not exist. Wayne County did operate several monitors for PM_{2.5} for three or four years during the 1980s, but because the measurements are very labor intensive, they are not done anymore. The PM_{2.5} filters are very small and a completely controlled environment is needed for measurement. Wayne County had to bring samples to the General Motors Technical Center for weighing.

Dr. Fischer said that there was also information presented at the meeting about the interaction between particulates and gases and the fact that the toxicity of the gas could be increased under certain conditions. Dr. Harkema said that a primary researcher in

this area was Guenter Oberdorster, University of Rochester. The particulates may be carrying gases, and there may be an additional interaction between the two. Dr. Oberdorster began his research by conducting experiments with Teflon particles, because he could generate ultra fine particles from them. Teflon carries potentially toxic gases itself, and although he was able to separate those out, he realized that Teflon was not a good surrogate and is now using black ultra fine particles. Dr. Wolff indicated that the ultra fines are more plentiful near their sources, but that they coagulate and grow into larger particles and do not live long in the atmosphere.

II. EXECUTIVE DIRECTOR'S REPORT

Mr. Harrison discussed some of the literature that had been sent to the Panel and asked that members send any new documents that they independently obtain to the MESB office, so they can be distributed.

III. PRESENTATION

Dr. Frederick Lipfert, private consultant and part-time employee of the Brookhaven National Laboratory, spoke on long-term studies, trends and measurements in PM_{2.5}, some problems with those measurements, and time series studies. A synopsis of his presentation may be found in Attachment 1.

Dr. Demers asked Dr. Wolff if the CASAC had an opinion about the exclusion of the negative Abbey study mentioned by Dr. Lipfert. Dr. Wolff replied that when CASAC pointed out that it was not given equal weight, the USEPA responded that it did not have the statistical power of the others and that Abbey had used total suspended particulates (TSP) rather than PM_{2.5}. Many of the CASAC members felt that this was being turned under the rug and were skeptical of the Pope and Harvard studies. Dr. Fischer commented that in the weight of evidence approach used in the past few years, positive studies are added up and negative ones tend to be ignored. As soon as the evidence gets high enough, the case is considered virtually proven. Negative studies need to be considered and given equal weight in the process.

Drs. Fischer, Harkema and Demers asked about the value of the PM_{2.5} measurements Dr. Lipfert had based his own conclusions about trends on, since he also spoke about the inadequacy of PM_{2.5} measurements. Dr. Lipfert responded that he could not say how well the measurements were done since most were short-term spot measurements. The biggest problem with PM_{2.5} measurements is that they are less accurate at the lower end due to the crude measurement technology. That will throw off all correlations.

Dr. Demers stated that he would like to see some PM_{2.5} and PM₁₀ time series data on any location for as long a time as possible, in order to determine if there is a stable proportion between PM₁₀ and PM_{2.5}. If that is the case, PM₁₀ would be a cheaper surrogate for PM_{2.5} measures. Mr. Harrison indicated that he will contact the Michigan Department of Environmental Quality to see whether they have the Wayne County data. Dr. Kummier added that in the current issue of *Air and Waste Management*,

Canadian researchers have published a ten year study using both PM_{2.5} and PM₁₀ that should be obtained.

There was a discussion about the difficulty of obtaining the Harvard and other air quality and epidemiological data on which the Natural Resources Defense Council and the USEPA proposed regulations are based. The Panel members also indicated that they would like to hear from Dr. Jonathan Samet. According to Dr. Wolff, Dr. Samet thinks some of the data and analysis is good and points to a problem, but not all. Dr. Samet recommended that a PM_{2.5} standard be set only if the USEPA is confident that reducing PM_{2.5} will reduce adverse effects. Mr. Harrison indicated that staff would continue to try to get Dr. Samet for a presentation.

Dr. Harkema asked about Dr. Lipfert's interpretation of how and why chronic obstructive pulmonary disease builds up with TSP. He responded that it is a long-term process, and may be the result of the insoluble components of the particles, which may be a problem in chronic lung conditions as they deposit and are not removed. Dr. Wolff commented that Dr. Samet seems to feel that it is possible that it may be the components of particles which may be responsible for adverse effects. Dr. Demers said that such possibilities fit with theories that the particles may act as carrier systems, or may be inherently damaging to airways, or may be just associated with other things that happen to come in at the same time PM_{2.5} does.

Dr. Demers wants the Panel to invite a leading scientist who supports the new regulations. Mr. Harrison said staff would continue trying to get Drs. Jonathan Samet, Joel Schwartz and/or Arden Pope to come. He encouraged Panel members to contact other scientists they thought would be beneficial to the discussion either as a guest speaker or guest Panel member. Dr. Demers suggested that an environmental epidemiologist be added to the Panel. A number of names were suggested including that of Dr. Ken Rosenman, a Michigan State University epidemiologist with background in lung function. Finally, Dr. Demers indicated that he would like to try to obtain the services of Dr. Sverre Verdal from the University of British Columbia as possibly an advisor to the Panel. Dr. Demers and Mr. Harrison indicated they would follow up on the various leads.

V. PUBLIC COMMENT

Dennis Leonard, Detroit Edison, stated that the USEPA has a method for measuring PM_{2.5}, but that it does not capture volatile PM_{2.5}. According to Mr. Leonard, some epidemiologists are indicating that volatile matter may be more of a problem than the nonvolatile. The USEPA is also proposing new methods to take this into account. The Electric Power Research Institute is in the process of trying to gather some nationwide data on PM_{2.5} in order to develop an appropriate methodology that can be standardized. Mr. Leonard said he would report on the status of that project at the next meeting.

Karen Kendrick-Hands, Eastern Michigan Environmental Action Council, supported the Panel's recommendation that an epidemiologist be added to the Panel.

V. NEXT MEETING DATE

Mr. Harrison indicated that his office would contact the Panel members to schedule the next meeting.

VI. ADJOURNMENT

The meeting was adjourned at 12:00 noon.

Respectively submitted,
Keith G. Harrison, M.A., R.S., Cert. Ecol.
Executive Director
Michigan Environmental Science Board

Attachment 1. Synopsis of Dr. Frederick W. Lipfert's February 18, 1997 Presentation to the Michigan Environmental Science Board.

Dr. Lipfert indicated that he had prepared a section of the USEPA criteria document evaluating the Harvard, Pope, and Abbey studies, which are all prospective, and were all given equal weight. However, the USEPA staff paper ignored his analysis and excluded the Abbey study, saying that the sample size was small. He disagrees with the USEPA's position. There are too many measurement, statistical, and analytical problems with the all of the prospective studies.

The long-term effects of air pollution are not well known. Most available data are for short term effects. There are several kinds of health effects associated with long-term studies and researchers often assume that if some health effect; e.g., annual mortality rate, is measured over a long period of time, there is some chronic disease underlying it. That assumption is not always warranted. The typical way of studying long-term effects is to look at some health index as a function of geography.

Dr. Lipfert presented a series of slides on mortality rates which compared the eastern and western US. The west is generally healthier than the east, and has been since (at least) the 1950s, according to overall mortality data. There is some correlation between those areas and an overlay of air quality maps from 1980 and earlier. But how much of the evident correlation is caused by air quality and how much is caused by other factors cannot be discerned. COPD is high in the west and also in West Virginia. Dr. Lipfert says he has found that COPD mortality is highly associated with TSP. But this pattern is different than that for total mortality. So there are relationships, but they are not always in the same direction. An additional problem with long-term studies is that none of the diseases of theoretical interest in air pollution studies is unique to air pollution. They all have a variety of causes.

Past studies have all been epidemiological and have not been able to make the connection between air quality and individual outcomes. Ideally in a study, there should be a group of exposed individuals, a group of those exposed who were susceptible due to illness or other problems, and a group who were actually affected. The underlying assumption in these studies is that the people who were impacted were the most susceptible, but that is not really known. Pope's work and the Harvard Six City study, for instance, found that people with occupational exposures and smokers were no more susceptible to air pollution than others. To Dr. Lipfert, a long-term study also should include data on diet and lifestyle. But even this will be complicated by confounders - factors associated with both the end point and the agent. Exercise, for instance, has a strong negative relationship to heart disease mortality. However, there is also a positive relationship between physical activity and sulfate air concentration, because of common geographic patterns. So exercise is a confounder, related both to sulfate as a fine particle and to the end point of interest, longevity.

The Harvard study, while based on data about individuals followed over a period of years, did not include lifestyle data or individual exposures to air pollution. The study ended up attributing 26 percent of the difference in mortality between the cities with best and worst air quality to air pollution alone. In fact, except for Topeka, for which there are no lifestyle data available, the difference is as well explained by state level lifestyle data. The Pope study suffers from the same limitations. The studies all use data from central air monitoring stations in lieu of individual exposures.

Dr. Lipfert indicated that he did an investigation for the US Department of Energy a few years ago. He was very careful to obtain good TSP data, with 1400 monitors (an average of ten at each location), and to account for as many confounders as possible. He found only a weak relationship between mortality and either TSP or ozone. About three percent of mortality was associated with TSP. Fine particles, including sulfates, were found to be statistically significant.

The Abbey study was different than Harvard or Pope studies. It was done in California on Seventh-Day Adventists state-wide, looking at cumulative exposure over a period of years using data from the monitoring stations nearest to where the particular people lived at various times. It found a zero effect. Dr. Lipfert indicated that he found the methods and result worth looking at and considering.

Dr. Lipfert stated that in the $PM_{2.5}$ debate it has been said that $PM_{2.5}$ has been uncontrolled. But the idea that coarse particles can be controlled without affecting fine particles is not logical. Dr. Lipfert believes that since air pollution control began in the 1960s, available data have indicated a marked improvement in air quality. Emissions of all kinds have declined from 1940 to 1990, including fine particles. Analyzing all the published $PM_{2.5}$ data he found a trend of five percent to six percent decrease a year when plotted against time.

Dr. Lipfert went on to discuss a number of "Air Quality Myths" he had encountered. There is a myth that you only have PM in an urban area, but in fact whenever PM is generated is in the combustion process, other substances - carbon monoxide, NO_2 - are being made at the same time. Some researchers have indicated that only fine particles can penetrate buildings, which is untrue. Penetration does not depend on particle size. Fine particles tend to stay airborne longer, with the coarse ones settling out. Coarse particles are also more easily recirculated due to disturbances. It is said that TSP contains very large particles. Dr. Lipfert indicated this can happen, but the TSP measurements are at least half small particles, and TSP is not an unreasonable parameter to use for epidemiological work. The idea that outdoor particulate measurements can be used to measure human exposure is patently not true. Most people are indoors 90 percent of the time where air quality is different. Monitors are normally placed at higher elevations than people breathe. Further, crude measurement instruments for coarse and fine particles lead to additional statistical errors, where correlations are only accurate for higher numbers.

In terms of time series studies, in analyzing data on mortality and pollution in London, Dr. Lipfert indicated that the time between episodes of high pollution affected mortality, and that the time between episodes is a predictor of the severity of the next episode. That may be the harvesting effect. The data do not show an adverse effect of repeated episodes. When comparing the results of time-series studies in a given place (e.g., London) over the years, a statistical anomaly is seen. The cleaner the air, the larger the coefficient used to calculate the mean effect becomes. And no matter how much cleaner the air gets, about the same number of deaths are associated with air pollution each year. There is either something strange going on in the pollution, or the wrong variable is being measured. There has been a big problem figuring out just how the process of pollution-causing mortality works. Some researchers have found a same day relationship, others find a wide range of lag times. He thinks many of the relationships that have been found, including the one for the Utah steel mill, have been matters of coincidence. When different time periods have been used, the relationships break down. There is nothing to explain why hospitalizations for asthma, bronchitis, and heart disease are going up while the air has gotten cleaner over time.

Dr. Lipfert and R.E. Wyzga (1997) looked at 27 time-series studies involving particulate matter last year. They all got about the same mean result for all studies. The trouble was that they were all done in different areas of the US, Europe, and South America, where particles and other factors are all different. What the studies do have in common is the architecture of the statistical method. He thinks researchers may be finding spurious correlations. If there is an air pollution effect, he thinks it is more likely to be a result of carbon monoxide, which is the same everywhere. The USEPA needs to find out why cleaner air is not making people healthier in the long term. They need to put more emphasis on research and monitoring.